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Amateur Photographer.

THE PHOTO-ENGRAVING PROCESSES.

I.—ZINCOGRAPHY.



ONE of the most interesting and valuable uses of applied photography is found in its application to the production of printing blocks and engraved plates. By the photo-engraving processes light is called in to do the work of the draughtsman. The purpose of the present series of articles is to give concise and practical descriptions of a few of the best of the various methods now in common use. Only those processes will be selected which are known to be capable of yielding good results in careful hands, and only the necessary working details will be given.

Modern photographic engraving may be classified under two heads: (1) Typographic blocks; that is, those etched in relief, and printed from the surface like type. (2) Engraved plates; that is, plates etched in intaglio, and printed from the etched lines like an engraved copperplate.

The possibility of photo-engraving rests on the simple fact that certain substances, such as bitumen or gelatine in connection with a chromic salt, are rendered insoluble by the action of light. If a metal plate is covered with a bichromated gelatine solution, and, when dry, exposed to light under a negative, the gelatine will become insoluble in those parts upon which the light has acted; that is, under the lines of the negative. By immersing such an exposed plate in warm water all the soluble gelatine will be washed away, leaving the metal bare. Or the plate may be inked up and immersed in cold water, and the ink removed from the still soluble portions by gentle friction with a soft sponge. In this case the lines of the negative will be reproduced in black ink on a ground of gelatine. Such a plate, with proper treatment, can be etched into high relief.

Owing to its simplicity, cheapness and wide range of application, photo-zincography is the most important of photo-engraving methods, and for this reason it will be the first described.

For line work the bitumen method now to be explained will give excellent results.

THE BITUMEN PROCESS.—The objection commonly made to the use of bitumen is, that the time of exposure is too prolonged for commercial work where rapidity is a prime essential. While this is true of the crude bitumen dissolved in benzole, which is commonly used, it is possible by purifying the bitumen by means of ether, to secure a purified article which will work nearly as rapidly as bichromated albumen and with much more certainty on very fine work. The bitumen is purified by pouring eight ounces of methylated ether over four ounces of the crude product previously powdered in a mortar. After a thorough shaking the bottle is tightly corked and set away in a dark place for a few hours. The contents of the bottle are again shaken, and the bottle is set away for twelve hours. The ether is then poured off and the bitumen drained dry. Eight ounces of fresh ether are then added, and the bitumen is well stirred with a glass rod. The stirring is repeated at intervals for twelve hours, the ether being then poured away, the bitumen drained closely, and eight ounces of fresh ether added; this operation is repeated six or eight times, and the bitumen is then allowed to dry. Twenty grains of this, purified, dissolved in eight ounces of pure benzole, forms the sensitizing mixture which is poured upon a planished zinc plate, which has been again polished with fine pumice-stone and water, well washed and dried.

For coating, the plate is placed upon a rotating table or whirler, and dusted with a soft brush. A little of the bitumen solution thoroughly filtered is poured upon the surface, and a rapid motion given to the plate. As soon as the plate is hard and dry, it is ready to be exposed under an intense reversed negative. For line work the negatives must be of the kind technically known as "black and white," that is, those in which the parts corresponding to the whites of the print are perfectly opaque, and the lines show no trace of veiling or fog. With such negatives five to ten minutes' exposure in full sunlight, or one hour in diffused light, will be sufficient.

Development.—The exposed plate is developed with turpentine in a shallow tray, which is gently rocked until the lines show clearly and sharply owing to the washing away of the unaltered, and, therefore, soluble bitumen. The plate is then washed under the tap until all greasiness has disappeared, and, immersed in a bath of nitric acid one half a dram, water eighteen ounces, and alum, ten grains until the unprotected parts assume a slightly grained appearance which gives greater clearness and distinctness to the lines. The plate is now rinsed under the tap, and gently rubbed with a tuft of cotton wool. If any of the lines seem clogged up or obscured, the plate must be again treated with turpentine until the bitumen is dissolved, the tray being gently rocked as before. The plate is then washed, blotted off and dried. It is then covered with a solution of gum-arabic, three ounces, chromic acid, thirty grains in thirty ounces of water. The back and sides are protected from the action of the etching fluid by a coat of shellac or asphalt varnish, and the plate is inked with a fine-grained leather roller thinly charged with thick transfer ink.

Etching.—The etching of a relief block is a long and tedious process. From four to eight etchings will be necessary according to the amount of relief desired. Etching is best done in a gutta-percha tray, which must be kept constantly rocking to prevent heating of the plate and to secure uniformity of action. If the beginner is able to see a plate etched by a good workman he will

be saved much of the disappointment and failure which inevitably accompany all first efforts in an unknown subject. In default of this, careful attention to the detailed instructions which follow, will, with a little practical experience, insure success. The inked plate is immersed in a nitric acid solution 1 to 50, and etched from three to five minutes according to the fineness of the details. It is then rinsed with water, dried and inked up. Finely powdered resin is then dusted over it. All the resin is dusted off from the exposed portions, and the plate is heated until the resin and ink melt. The acid bath is strengthened to 1 to 40, and the plate is again etched for five minutes. Between each etching the plate is washed, dried, inked, dusted with resin, and heated as before, and the time of etching is increased one half for each biting in. The strength of the third acid bath is 1 to 30; for the fourth, 1 to 20, and for subsequent etching, 1 to 15. This latter proportion must not be exceeded or the plate will become overheated.

When the necessary depth is reached the ink is removed with a brush dipped in a mixture of two parts of turpentine and one part of benzine, and the plate is polished with alcohol and chalk. On careful examination it will now be seen that the lines show gradations due to the repeated etchings. If these were not removed the prints would present an unsightly appearance. To remove these gradations the surface of the plate is inked up with a very stiff ink until the color reaches to the first gradation; powdered resin is then dusted on, and after the surplus is carefully removed the plate is heated until the color and the resin are melted together; it is then etched in a 1 to 30 acid bath for five minutes, a soft brush being constantly swept over the picture-bearing surfaces. This removes all the gradations, and after a thorough cleaning the plate is ready to be trimmed, routed where necessary, and blocked up type high for the press.

This process is one of the best for pure line work, and gives results which are eminently satisfactory. The prepared plate will keep in good working condition if stored in a dry, dark place.

The albumen, gelatine and transfer processes will be described in a later article. W. H. BURBANK.

HINTS FOR AMATEUR PHOTOGRAPHERS.

HYDROCHINON as a developing agent seems to be steadily growing in favor. It is a powerful, though slow, reducing agent, does not tend to "pile up" density in the high lights, has little or no tendency to produce fog, stains neither the hands nor the plate, and, according to Abney, requires only half the exposure necessary with pyrogallol. As showing its reducing power Eder states that if a wet collodion plate be washed, flooded with a solution of ammonia and hydrochinon, and exposed in the camera, the picture will make its appearance on the plate during the exposure. It would seem possible then to expose and develop simultaneously. Some German manufacturers now make a plate the back of which is coated with a solution of hydrochinon and ammonia in gum water. To develop such a plate it is only necessary to place it in the proper quantity of water, which soon dissolves the coating and allows the developing agents to act on the exposed film. Probably, however, this method is more curious than practical. Hydrochinon seems to be especially valuable as a developing agent for instantaneous work, lantern-slides, and for subjects having extreme contrasts of light and shade, which, although beautiful in nature rarely give satisfactory prints, owing to the tendency which other developers have of burying the detail in the high lights beneath an opaque deposit of silver. It is probable that the perfect hydrochinon developer has not yet been formulated. The following is free from useless complications, keeps well and is reliable:

- (1) Sulphite of soda (crystals).....240 grains.
Filtered rain water..... 4 ounces.
Filter the solution and add
Hydrochinon (Merck's)..... 60 grains.

(2) A saturated solution of carbonate of soda. For development place two drams each of 1 and 2 in a graduate, and add pure water to make up to four ounces; pour the solution over the plate, and allow it to act until the desired detail and density are obtained. As this solution can be used many times, it should be kept for use in a well corked bottle. Other forms of this developer have been made public, but this one, from its simplicity and general good qualities, is well suited to those who wish to make a trial of hydrochinon.

FLASH-LIGHT PHOTOGRAPHY has greatly lessened the difficulties attending the practice of house portraiture, and the taking of interiors. Much ingenuity has been displayed in the manufacture of apparatus to hold and ignite the magnesium compound. The cost of most of these pieces of apparatus seems to be greatly in excess of their value or cost of production, and their use may easily be dispensed with, with no falling off in the quality of the results. The handy magnesium cartridges now in the market supply all that is needed. I have recently examined a number of portraits, interiors and animal studies taken by means of these cartridges, and the results were in every way admirable, and a description of the simple means adopted in this case may prove suggestive to others. The subjects were posed a few feet in front of a neutral-tinted background, a twenty-grain magnesium cartridge was placed at an elevation of five or six feet, and about ten feet distant from the sitter, at the right or left, to form an angle of twenty-five or thirty degrees with the subject. In order to diffuse the light, and to prevent undue strength of cast shadows, a screen of white tissue paper was placed in front of the light, the camera was placed in position, and the subject focussed by holding a lighted candle close to the sitter's face, the fuse of the cartridge was then ignited and the exposure made. Even with the rapid plates used in these experiments, it was not found necessary to extinguish all the lights in the room. An exposure of some length in a room lighted by a single gas-jet or an oil lamp will not fog a

rapid plate, unless the rays fall directly upon the lens, and it was found that the expression of the eyes was better when the sitter was not left in total darkness previous to the exposure. In most cases it was found desirable to soften the strong shadows on the shaded side of the face by means of white side-screens. Among the pictures examined were some charming family groups, taken with a rapid rectilinear lens, with the light from forty grains of magnesium placed at a distance of twelve feet, no background or side-screens being used. These pictures afforded pleasing glimpses of home life, and were surprisingly good in general effect. The interiors examined were a surprise to one who knew something of the difficulties attending this class of work as usually practised. In these pictures there was no halation, no unevenness of illumination, no lack of detail in dark corners. Instead there was a softness and evenness of lighting, and an amount of detail, even in the dark shadows, which were a surprise and a delight. The rooms were of moderate size, and forty grains of the powder were used; the lens, a six-inch Morrison wide angle, being stopped down to f-25, to secure good definition. The chief charm about these pictures, apart from their technical excellences, was due to the presence in them of members of the family, thus giving them a more home-like look. The animal studies were particularly good, and demonstrated the value of the flash-light for this class of work. These few hints will sufficiently indicate the possibilities of nocturnal photography, and it is hoped remove some of the difficulties attending its practice.

THE POWDER OR DUSTING-IN PROCESS is not so well-known or so generally practised as its merits deserve. By it permanent pictures can be produced in any shade of color, and it affords a wider scope for artistic skill than any other photographic process. For positives on porcelain, opal, or plain glass, it stands almost without a rival, and a knowledge of it is almost indispensable for work in photo-ceramics, which is destined to become an important industry. Briefly described the process consists in coating a glass or other impervious surface with a mixture of gum-arabic, sugar and a little glycerine, to which a trace of bichromate of potassium has been added. The plate is dried in a dark room at a temperature of 90°. The dried plate is exposed for a few minutes beneath a transparency. The effect of the action of light is to harden the soluble matter composing the film. The parts acted upon will be found hygroscopic in proportion to the time of exposure and intensity of the light. Hence, after the plate is removed from the printing-frame and carried into the dark room, a reversed positive image can be developed by applying a small quantity of very fine powder of any material or color with a soft camel's-hair brush. The powder adheres to the hygroscopic parts in proportion to the amount of moisture they contain. If the image is slow in coming up, the plate may be gently breathed on or allowed to remain a short time to absorb moisture from the air. Artistic skill can work wonders in the development. Vignetting is easily accomplished by stopping the brush at the proper place. Prominent objects can be strengthened, and objectionable ones weakened. It is not my intention to give all the working details at this time. Reserving these for a future note, I give two formulæ for the sensitizing compound:

- (1) Saturated solution of bichromate of ammonia, 5 drams; honey, 3 drams; albumen, 3 drams; water, 3 to 4 ounces. This is to be well shaken, filtered through fine linen, and kept in a dark place.
- (2) Gum-arabic, 180 grains; white sugar, 240 grains; bichromate of potassium, 100 grains; glycerine, 20 to 60 drops; water, 10 ounces filtered as before. The plates are coated by pouring sufficient of these solutions over them to give a thin film; they are then placed in a perfectly level position, and dried by heat. When ordinary transparencies are used the prints are reversed. To transfer the developed images to paper or other permanent supports, they are coated with plain collodion, and transferred in the usual manner.

TRANSFERROTYPE PAPER.—One of the most important of recent improvements in photography is the introduction of a bromo-gelatine paper for printing purposes which allows the image to be transferred to any substance which does not contain grease or oil. This paper, to which the barbarous title of "transferotype paper" has been given, is simply paper coated with a film of soluble gelatine, and then given a coating of insoluble sensitive emulsion. The paper is exposed, developed, fixed, and washed exactly like the well-known bromide paper. When thoroughly washed it is brought into intimate contact with the moistened surface of the final support. The back of the paper is covered with blotting-paper, and a slight pressure is applied for half an hour, when the paper may be removed by immersing for a few minutes in water warmed to 110°. After soaking for two or three minutes, one corner of the paper is gently detached from the film with a pin, and the paper carefully drawn from the film. All adhering traces of the substratum are removed with a tuft of cotton dipped in hot water, and after a good rinsing under the tap, the picture is racked away to dry. It is evident that the process readily lends itself to a variety of pleasing and artistic uses. Such materials as porcelain, china, wood, ivory, celluloid, leather, silk, silver, gold, shell, marble, plain and ground glass, may form the final support. Window transparencies, lantern slides, decorated lamp-shades, and many other household ornaments, may be easily and inexpensively produced, while a very good imitation of fired tiles may be made by transferring the prints to glazed tiles, which are then coated with dammar varnish or albumen, and baked in an ordinary oven. Such tiles will withstand a moderate amount of heat, and can be washed with impunity. These transferotype pictures can be painted over, and may therefore be used as a basis for coloring. Other applications of the process will suggest themselves to the reader, who will find the new paper a tractable servant.

W. H. B.